FEMA 209: 390161

FLOOD INSURANCE STUDY

CITY OF LANCASTER, OHIO

FAIRFIELD COUNTY

APRIL 17, 1989

Federal Emergency Management Agency

COMMUNITY NUMBER · 390161

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

CITY OF LANCASTER,
FAIRFIELD COUNTY,
OHIO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study revises and supersedes a previous Flood Insurance Study for the City of Lancaster, Fairfield County, Ohio (Reference 1). This information will be used by the community to update existing floodplain regulations as part of the regular phase of the National Flood Insurance Program. The information will also be used by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for Raccoon Run were obtained from the Flood Insurance Study for Fairfield County, Ohio (Reference 2).

The hydrologic and hydraulic analyses for the remaining streams studied were performed by U.S. Soil Conservation Service (SCS) (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-86-E-2225. This study was completed in August 1987.

1.3 Coordination

SCS representatives met with the Lancaster City Engineer on June 26, 1986, for the initial coordination of this study and a review of the changes that have occurred in the floodplain since the previous study was prepared, including new bridges, culverts, and buildings. Kosanchick and Associates, Inc., and SEICO, Inc., supplied topographic data showing recent development in the floodplain (References 3 and 4).

On May 4, 1988, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Lancaster, Fairfield County, Ohio. The area of study is shown on the Vicinity Map (Figure 1).

Flooding caused by overflow of the Hocking River, Pleasant Run, Baldwin Run, Ewing Run, Fetters Run, Tarhe Run, Hunters Run, Raccoon Run, Lateral A, Lateral B, and Lateral D was studied in detail.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazard.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through August 1992. The scope and methods of study were proposed to and agreed upon by FEMA and the City of Lancaster.

2.2 Community Description

The City of Lancaster is in central Fairfield County in central Ohio, about 30 miles southeast of the City of Columbus, Ohio, and is surrounded by the unincorporated areas of the county. Lancaster is served by U.S. Routes 33 and 22; State Routes 37, 158, 188, and 793; the CSX railroad; and Conrail. The 1980 population of the incorporated area of Lancaster was reported to be 34,953 (Reference 5)

The highest elevation in the study area is about 1,100 feet National Geodetic Vertical Datum of 1929 (NGVD) at Mt. Pleasant in Rising Park. The lowest point is about 800 feet NGVD where the Hocking River leaves the area. There is about 300 feet of relief within the watershed. The topography is rolling because the area is located on end moraines of the glaciated Allegheny Plateau. This is a transition area between the flat glacial till plains to the northwest and the hilly, unglaciated Allegheny Plateau to the southeast. The soils on the uplands are primarily light-colored Alexandria and Cardington silt loams that have formed in glacial till. The soils on the flat, relatively wide bottomlands around Pleasant, Ewing, and Fetters Runs and the Hocking River consist of mixtures of soils that have formed on glacial lake deposited clays, glacial outwash gravels, and recent alluvial silts. Typical soils in these areas are the Montgomery, Fox, and Eel series (Reference 6). The bedrock in the study area consists of sandstone and conglomerate that is almost completely covered by glacial materials left during the retreat of the last glacier.

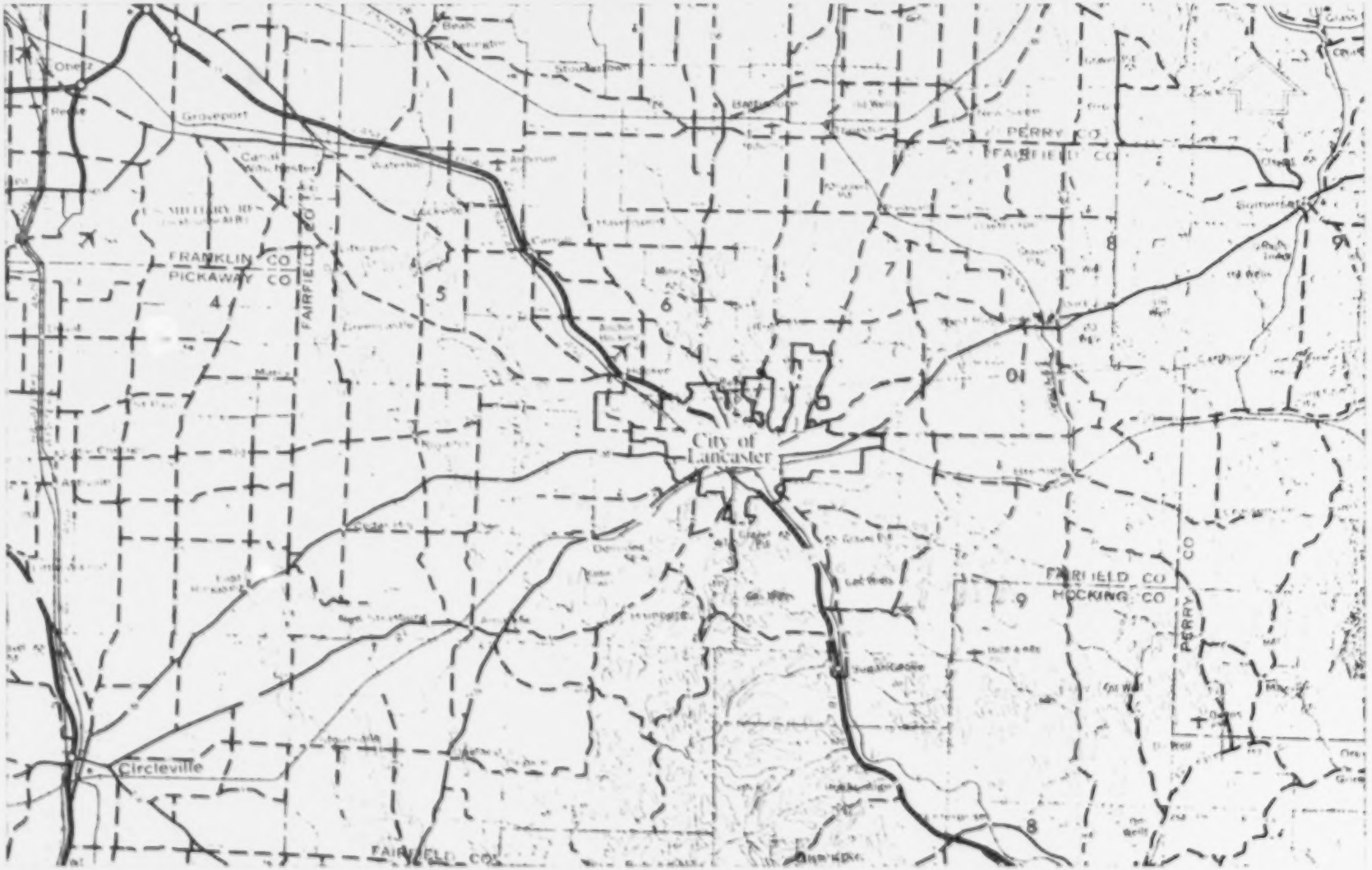

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

Lancaster is in the northern temperate zone. The climate is humid with warm summers and mildly cold winters and precipitation is distributed quite evenly throughout the year. The mean annual precipitation in the area is 40.75 inches (Reference 7), more than 2 inches greater than the mean for the entire state and more than 7 inches greater than the mean for the flat, northwestern part of the state.

The approximate percentages of land use in the watershed, a part of the Hocking River basin, are as follows: cropland, 50 percent; pasture and meadow, 18 percent; woods (hardwood), 9 percent; urban, 19 percent; and miscellaneous, 4 percent. The development in the floodplain in Lancaster is a mixture of residential, commercial, warehousing, and light industry. The floodplain is almost completely developed in the central part of the city. As one moves towards the city limits, there is less development in the floodplain.

2.3 Principal Flood Problems

The most severe flood known to have occurred in Lancaster was on the night of July 21, 1948. Approximately 8 to 10 inches of rain fell in the Upper Hocking River and North Hocking River watersheds. Over 200 residences and businesses were flooded and the resulting damage totaled over $1,000,000. The U.S. Geological Survey (USGS) determined the discharge at the mouth of Hunters Run, with a drainage area of 10 square miles, to be 11,200 cubic feet per second (cfs), an extremely high discharge for such a small drainage area.

Flooding also occurred on January 1, 1959; March 5, 1963; May 28, 1968; April 2, 1970; and February 24, 1975 (Reference 8). Estimates of the frequency of these floods are not available. Flooding in Lancaster frequently occurs in the George Street and Mulberry Street areas, in the Maple Street area adjacent to the river, and along Sugar Grove Road.

During the evening of July 21, 1976, approximately 0.7 to 1.0 inch of rain fell along Pleasant Run upstream of Main Street on U.S. Route 22. On July 22, 1976, another 3.0 to 3.1 inches of rain fell in that drainage area, which is the amount equivalent to approximately a 10-year storm. Amounts of rain falling over the Hocking River watershed varied considerably. Water flowed over Main Street on the morning of July 23, 1976.

The most recent flooding occurred in Lancaster from June 13 to 14, 1981. An intense thunderstorm centered over the Baldwin Run watershed resulted in extensive flooding. Several stores in the shopping center along East Main Street were heavily damaged. It was an approximately 25-year frequency flood in that portion of the watershed.

2.4 Flood Protection Measures

In 1956, two streamflow measuring gages were established in the watershed by the USGS, one on Hunters Run and one on the Hocking River. About the same time, construction of the Upper Hocking (Pilot) Watershed Project started (Reference 9). Installation of the gages and construction of the

floodwater prevention structures took place primarily because of the damage suffered in the 1948 flood. The watershed project was completed in 1961. Eight floodwater-retarding structures were installed that controlled 24.4 square miles of drainage area and provided 6,245 acre-feet of temporary flood storage (Reference 9). Since the installation of the reservoirs, downstream flood peaks have been rather uniform because of the temporary flood storage provided. Several years ago, many of the streams in Lancaster were cleaned and the spoil piled on the banks. The spoil prevents flooding from many of the more frequent storms. However, the reliability of these spoil-pile dikes is questionable.

In addition, a plan for urban flood protection for the City of Lancaster (Reference 10) has been approved for implementation. The plan includes the construction of dikes, a floodwater-retarding dam on Tarhe Run, and a flood warning system. None of the measures have been installed and were not considered in the preparation of this study.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

Discharge-frequency relationships for the streams studied in detail were established by valley and structure flood routings computed using the TR-20 computer program (Reference 11). The convex method in this program is used for stream valley flood routing. Rainfall data to establish frequency was obtained from Technical Paper No. 40 (Reference 12).

The discharge values obtained from TR-20 were compared to stream gage records on Hunters Run and the Hocking River and to discharge values

calculated by regression equations (Reference 13). Differences in the values were attributed to the implementation of the Upper Hocking Watershed Project (Reference 9) and urban development.

Peak discharge-drainage area relationships for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
HOCKING RIVER					
just upstream of Sugar Grove Road	64.9	6,800	9,500	11,000	14,100
just upstream of confluence of Baldwin Run	51.4	5,100	7,200	8,300	10,500
just upstream of confluence of Tarhe Run	47.8	5,000	7,000	8,100	10,200
just upstream of confluence of Hunters Run	35.6	4,100	5,300	6,100	7,700
at Pierce Avenue	31.3	3,500	4,500	5,200	6,600
at Ety Road	28.4	2,600	3,400	3,900	4,800
at Collins Road	11.8	900	1,100	1,300	1,600
PLEASANT RUN					
just upstream of Main Street	9.1	1,700	2,300	2,600	3,300
BALDWIN RUN					
at mouth	13.1	4,400	6,300	7,300	9,100
EWING RUN					
at mouth	5.2	2,300	3,200	3,700	4,700
just upstream of Tiki Lane Road	3.7	2,100	2,900	3,400	4,200
FETTERS RUN					
at mouth	7.1	2,100	3,100	3,600	4,500
just upstream of Fair Avenue	6.5	2,100	3,000	3,400	4,300
just upstream of Granville Pike	5.1	1,800	2,600	3,000	3,800

TABLE 1 - SUMMARY OF DISCHARGES (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
TARHE RUN					
at mouth	3.1	1,200	1,800	2,100	2,700
just upstream of Broad Street	1.9	760	1,100	1,300	1,600
HUNTERS RUN					
at mouth	11.2	1,600	2,100	2,400	2,800
LATERAL A					
at mouth	2.5	610	900	1,100	1,400
LATERAL B					
at mouth	1.7	470	610	690	860
LATERAL D					
at mouth	3.0	1,100	1,500	1,700	2,200

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-section data in some areas of recent development were obtained from topographic data supplied by Kosanchick and Associates, Inc., and SEICO, Inc. (References 3 and 4). All other cross sections and structural geometry were obtained by field surveys.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

Roughness values (Manning's "n") were obtained by field inspection and based on criteria outlined in the SCS "Guide for Selecting Roughness Coefficient "n" Values for Channels" (Reference 14). Manning's "n" values for the Hocking River channel range from 0.025 to 0.065 and values for the floodplain range from 0.035 to 0.25. For all other streams, values for the channel range from 0.025 to 0.075 and values for the floodplain range from 0.03 to 0.2.

The starting water-surface elevations for the Hocking River were obtained from the Hocking River Flood Hazard Analysis Report (Reference 8). The starting water-surface elevations used for all other streams were obtained by the slope-area method. Water-surface elevations for the streams studied in detail were computed using the WSP-2 computer program (Reference 15). The floodways were determined using the TR-64 computer program (Reference 16).

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals. In cases where the 50- and 100-year flood elevations are close together, due to limitations of the profile scale, only the 100-year profile has been shown.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the NGVD. Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24000 with contour intervals of 10 and 20 feet (Reference 17).

The 100-year and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE) and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary was delineated using the Flood Insurance Rate Map contained in the Flood Insurance Study for the City of Lancaster (Reference 1).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and the 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodways for Raccoon Run, Ewing Run, and Lateral D lie outside the corporate limits.

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than a 1.0-foot increase in the base flood elevations at any point within the community.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
HOCKING RIVER								
A	1980	347	2259	4.9	809.8	809.8	810.8	1.0
B	3810	908	4733	2.3	811.6	811.6	812.6	1.0
C	4490	103	1035	8.0	811.7	811.7	812.7	1.0
D	5093	93	1029	8.1	813.5	813.5	814.5	1.0
E	6265	103	1183	7.0	815.9	815.9	816.9	1.0
F	6890	463	3399	2.5	816.9	816.9	817.9	1.0
G	7790	451	4593	1.8	818.0	818.0	819.0	1.0
H	8615	88	1265	6.4	818.1	818.1	819.1	1.0
I	10,445	494	7532	1.1	819.3	819.3	820.3	1.0
J	10,965	400	5562	1.5	819.4	819.4	820.4	1.0
K	12,240	839	7298	0.8	821.4	821.4	822.4	1.0
L	12,740	913	4246	1.4	821.5	821.5	822.5	1.0
M	13,440	1036	8414	0.7	821.9	821.9	822.9	1.0
N	14,040	1490	14,059	0.4	822.1	822.1	823.1	1.0
O	15,115	1072	8809	0.7	822.2	822.2	823.2	1.0
P	16,190	1097	9487	0.6	822.4	822.4	823.4	1.0
Q	16,990	797	6421	0.9	822.5	822.5	823.5	1.0
R	18,190	786	5642	1.1	823.1	823.1	824.1	1.0
S	19,540	962	5640	0.9	823.3	823.3	824.3	1.0
T	19,925	448	3342	1.5	823.6	823.6	824.6	1.0
U	21,025	490	5438	1.0	823.7	823.7	824.7	1.0
V	23,885	462	3540	1.5	823.8	823.8	824.8	1.0
W	24,235	114	781	6.0	824.4	824.4	825.4	1.0
X	25,585	358	2267	2.1	827.3	827.3	828.3	1.0
Y	26,535	567	3716	1.0	828.2	828.2	829.2	1.0
Z	28,785	949	2819	1.4	830.8	830.8	831.8	1.0

[1]FEET ABOVE CORPORATE LIMITS

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

FLOODWAY DATA

HOCKING RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
LATERAL A								
A	1000	159	950	1.1	823.8	823.8	824.8	1.0
B	2381	42	268	4.0	832.2	832.2	833.2	1.0
C	3881	65	244	4.4	843.7	843.7	844.7	1.0
D	4581	28	147	7.3	850.1	850.1	851.1	1.0
E	5181	69	362	2.9	853.8	853.8	854.8	1.0
F	5914	56	363	2.9	856.8	856.8	857.8	1.0
G	7176	59	263	4.7	863.3	863.3	864.3	1.0
H	7686	165	391	2.7	866.4	866.4	867.4	1.0
LATERAL B								
A	750	40	288	2.4	824.1	824.1	825.1	1.0
B	1564	38	244	2.8	829.7	829.7	830.7	1.0
C	2118	99	604	1.1	830.5	830.5	831.5	1.0
D	2791	144	1093	0.6	836.1	836.1	837.1	1.0
E	4521	31	158	4.4	840.7	840.7	841.7	1.0
F	5312	83	545	1.3	849.0	849.0	850.0	1.0
G	6187	86	374	1.9	851.7	851.7	852.7	1.0
H	7390	55	246	2.9	856.5	856.5	857.5	1.0
I	8325	39	191	3.8	860.7	860.7	861.7	1.0
LATERAL D								
A	4139	189	189	2.6	836.0	833.9[3]	834.9	1.0
B	4814	114	558	3.1	836.1	836.1	837.1	1.0
C	6314	135	919	1.9	842.8	842.8	843.8	1.0
D	13,210	309[2]	900	1.8	867.0	867.0	867.5	0.5

[1]FEET ABOVE MOUTH
[2]THIS WIDTH EXTENDS BEYOND CORPORATE LIMITS
[3]ELEVATIONS WITHOUT CONSIDERING OVERFLOW EFFECT FROM HOCKING RIVER

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

FLOODWAY DATA

LATERAL A—LATERAL B—LATERAL D

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
BALDWIN RUN								
A	1100	95	976	7.4	813.8	813.8	814.8	1.0
B	2250	412	2271	3.2	817.0	817.0	818.0	1.0
C	3230	101	1169	6.2	821.6	821.6	822.6	1.0
D	4155	145	1199	6.1	822.1	822.1	823.1	1.0
EWING RUN								
E	5975	84	514	7.3	827.8	827.8	828.8	1.0
F	7515	87	641	5.8	835.2	835.2	836.2	1.0
G	9275	45	317	11.8	843.1	843.1	844.1	1.0
H	10,775	111	617	6.1	849.9	849.9	850.9	1.0
I	12,625	125	741	5.1	857.1	857.1	858.1	1.0
J	14,535	73	478	7.1	869.2	869.2	870.2	1.0
K	15,565	95	722	4.7	872.8	872.8	873.8	1.0
L	16,685	78[2]	537	6.3	877.2	877.2	878.2	1.0
M	18,685	87[2]	501	6.8	890.0	890.0	891.0	1.0
N	20,445	109	894	2.2	904.9	904.9	905.9	1.0
O	22,045	66	242	8.0	911.7	911.7	912.7	1.0
RACCOON RUN								
A	34,049[3]	274	955	1.5	844.3	844.3	845.3	1.0

[1]FEET ABOVE MOUTH
[2]THIS WIDTH EXTENDS BEYOND CORPORATE LIMITS
[3]FEET ABOVE CONFLUENCE WITH RUSH CREEK

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

FLOODWAY DATA

BALDWIN RUN—EWING RUN—RACCOON RUN

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
FETTERS RUN								
A	1005	211	950	3.8	824.3	824.3	825.3	1.0
B	1990	74	501	7.1	827.6	827.6	828.6	1.0
C	2620	85	525	6.8	829.1	829.1	830.1	1.0
D	3460	56	462	7.4	831.9	831.9	832.9	1.0
E	4460	126	621	5.5	835.0	835.0	836.0	1.0
F	5390	70	465	7.3	839.9	839.9	840.9	1.0
G	6620	49	397	8.6	848.6	848.6	849.6	1.0
H	8020	82	520	6.6	855.1	855.1	856.1	1.0
I	8605	57	441	7.8	856.7	856.7	857.7	1.0
J	9040	78	516	6.6	859.9	859.9	860.9	1.0
K	9800	148	751	4.5	863.6	863.6	864.6	1.0
L	10,840	52	375	9.1	868.1	868.1	869.1	1.0
M	12,090	65	503	5.9	874.5	874.5	875.5	1.0
HUNTERS RUN								
A	715	547	4392	0.5	820.6	819.2[2]	820.2	1.0
B	1115	756	4052	0.6	820.7	820.7	821.7	1.0
C	1840	448	2164	1.1	821.8	821.8	822.8	1.0
D	3215	240	991	2.4	822.9	822.9	823.9	1.0
E	4615	47	404	5.9	828.1	828.1	829.1	1.0
F	5740	115	646	3.4	832.0	832.0	833.0	1.0

[1]FEET ABOVE MOUTH
[2]ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM HOCKING RIVER

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

FLOODWAY DATA

FETTERS RUN—HUNTERS RUN

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
PLEASANT RUN								
A	18,410	616	1543	1.7	821.9	821.9	822.9	1.0
B	20,035	295	1015	2.6	827.2	827.2	828.2	1.0
C	21,435	416	1416	1.9	828.8	828.8	829.8	1.0
D	22,770	165	774	3.4	832.4	832.4	833.4	1.0
E	24,525	287	982	2.7	835.8	835.8	836.8	1.0
F	24,795	75	377	7.0	836.3	836.3	837.3	1.0
TARHE RUN								
A	2259[2]	365	1495	1.4	821.0	821.0	822.0	1.0
B	3109[2]	309	801	2.6	824.1	824.1	825.1	1.0
C	4309[2]	51	261	8.0	831.6	831.6	832.6	1.0
D	4559[2]	78	453	2.8	834.5	834.5	835.5	1.0
E	4869[2]	58	325	3.9	837.9	837.9	838.9	1.0
F	6069[2]	115	451	2.8	841.8	841.8	842.8	1.0

[1]FEET ABOVE CONFLUENCE WITH HOCKING RIVER
[2]FEET ABOVE MOUTH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

FLOODWAY DATA

PLEASANT RUN–TARHE RUN

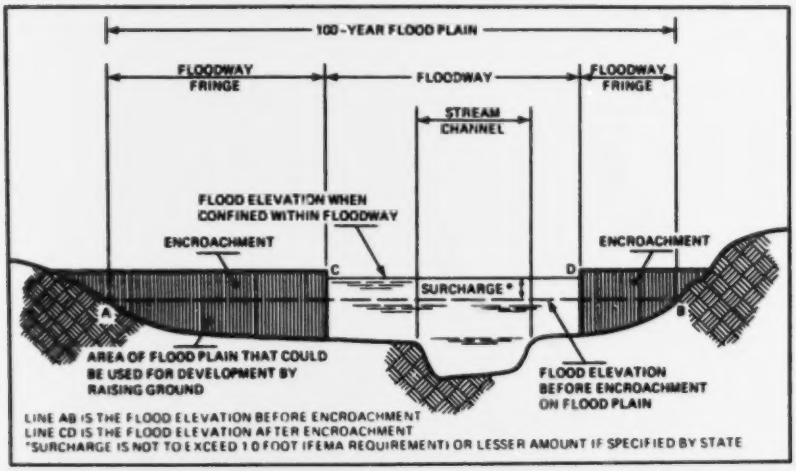
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2 - FLOODWAY SCHEMATIC

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

A Flood Insurance Study in progress for Fairfield County, Ohio (Reference 2) is in agreement with this study.

This Flood Insurance Study supersedes the previously published Flood Insurance Study for the City of Lancaster, Ohio (Reference 1).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 175 West Jackson Boulevard, 4th Floor, Chicago, Illinois 60604.

9.0 REFERENCES AND BIBLIOGRAPHY

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ELEVATION REFERENCE MARKS

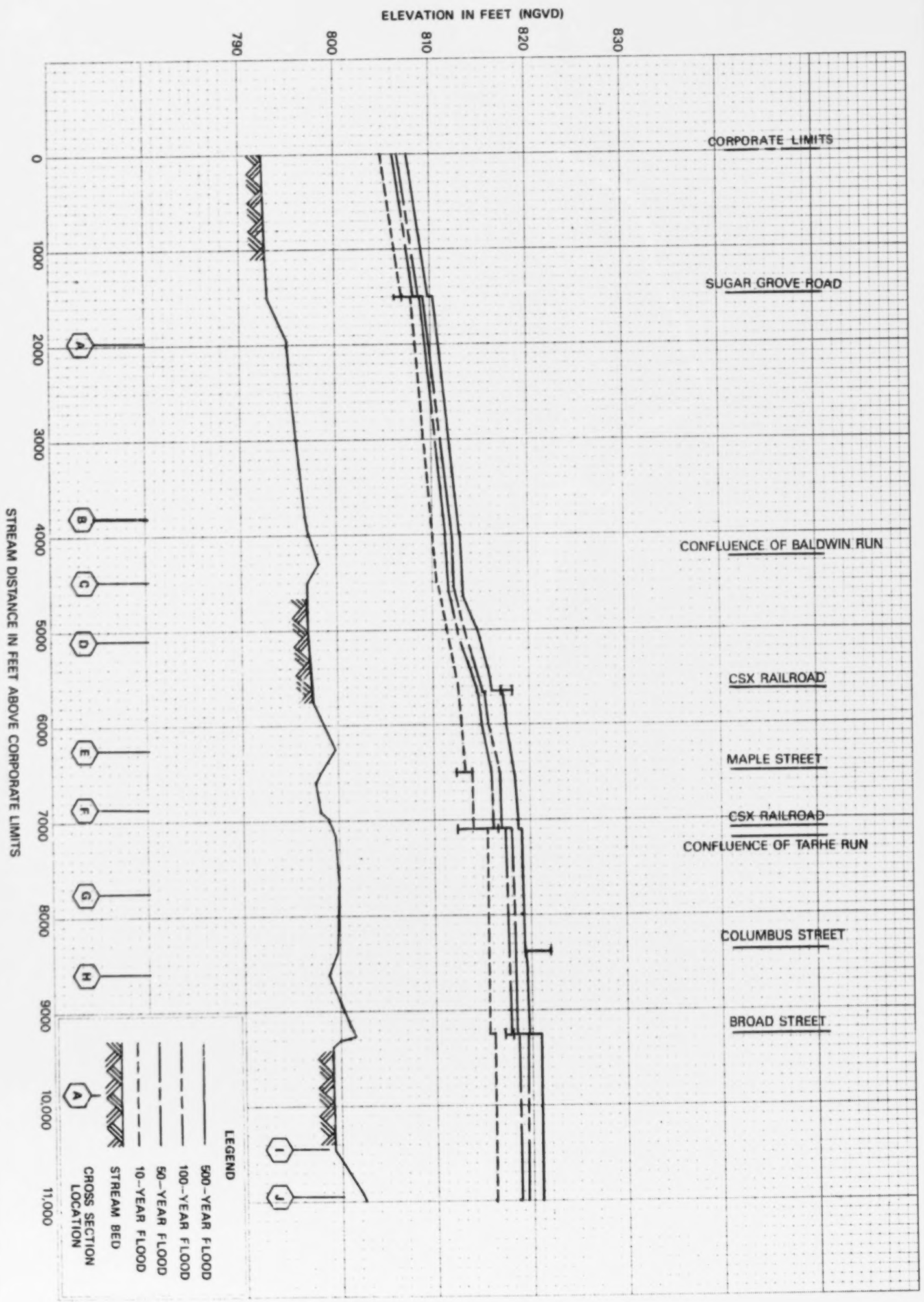
REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0001	897.37	top of yellow-painted nut on top of upstream end of multiplate culvert for Ewing Run under Rainbow Drive
2	0002	835.63	chiseled square on top of northwest abutment of Collins Road bridge over the Hocking River
3	0002	847.32	chiseled square on southwest headwall of Private Drive bridge over Lateral B, located about 300 feet south of intersection of Ety Road and Fair Avenue
4	0002	853.09	chiseled square on top of northwest headwall of twin 36-inch culverts for Lateral B under Hoffman Drive
5	0003	821.88	chiseled square on northwest abutment of 6th Avenue bridge over the Hocking River
6	0003	822.31	chiseled square on end of wingwall of southwest abutment of Fair Avenue bridge over the Hocking River
7	0003	825.10	chiseled square on top of northeast abutment of Pierce Avenue bridge over the Hocking River
8	0003	821.02	top center of manhole cover in sewer line due north of house no. 1819 Zimmer Street, about 450 feet northwest of intersection of Zimmer Street and Pratt Avenue
9	0003	827.76	chiseled square on downstream end of southeast abutment of CSX railroad bridge over the Hocking River, upstream of Pierce Avenue
10	0003	823.96	chiseled cross on third step from top of northwest abutment of Pleasantville Road bridge over Ewing Run

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
11	0003	823.27	chiseled cross on northeast corner on third step of abutment on Cherry Street bridge over Fetters Run
12	0003	831.79	chiseled cross on northwest corner of 6th Avenue bridge over Fetters Run
13	0003	832.74	chiseled cross on third step down on northwest abutment of Fair Avenue bridge over Fetters Run
14	0003	852.88	Lancaster City benchmark at northeast corner of wingwall of Columbus Road bridge over Lateral A
15	0003	854.05	chiseled square on southwest wingwall of Cold Spring Drive bridge over Lateral A
16	0003	828.40	chiseled cross on southwest corner of headwall at upstream end of 96-inch multiplate culvert for Lateral B under CSX railroad
17	0003	833.58	chiseled square on top of northeast headwall at Shasta Drive bridge over Lateral B
18	0003	880.95	chiseled square level with road surface in southeast corner of southeast concrete abutment of Granville Pike bridge over Fetters Run
19	0004	838.55	top of fire plug located at southwest corner of intersection of Main Street and Quarry Road
20	0004	834.50	top of round concrete monument with cross molded into top, painted red, located approximately 15 feet from west bank of Ewing Run, near yellow marker of Lancaster Municipal Gas Company, near east end of Frederick Street
21	0004	868.81	chiseled cross on northeast abutment of Tiki Lane Road bridge over Ewing Run

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
22	0005	807.91	chiseled cross in northeast abutment of Sugar Grove Road bridge over the Hocking River
23	0005	817.03	chiseled cross on third step of northeast concrete abutment of CSX railroad bridge over the Hocking River
24	0005	821.90	chiseled cross in the northeast concrete abutment of Columbus Street bridge over the Hocking River
25	0005	819.47	chiseled cross on northeast abutment of Broad Street bridge over the Hocking River
26	0005	822.48	chiseled square on top southwest abutment of Conrail bridge over the Hocking River, downstream of junction of the Hocking River and Hunters Run
27	0005	820.89	chiseled square on northwest wingwall of Lincoln Avenue bridge over the Hocking River
28	0005	821.50	chiseled square on east end of guardrail at northeast corner of Wheeling Street bridge over the Hocking River
29	0005	814.45	chiseled cross on northeast abutment of Lawrence Street bridge over Baldwin Run
30	0005	815.59	chiseled cross on southwest corner of Conrail bridge over Baldwin Run, about 6 feet below top of rail
31	0006	831.54	chiseled square in northeast wingwall of Conrail bridge over Pleasant Run



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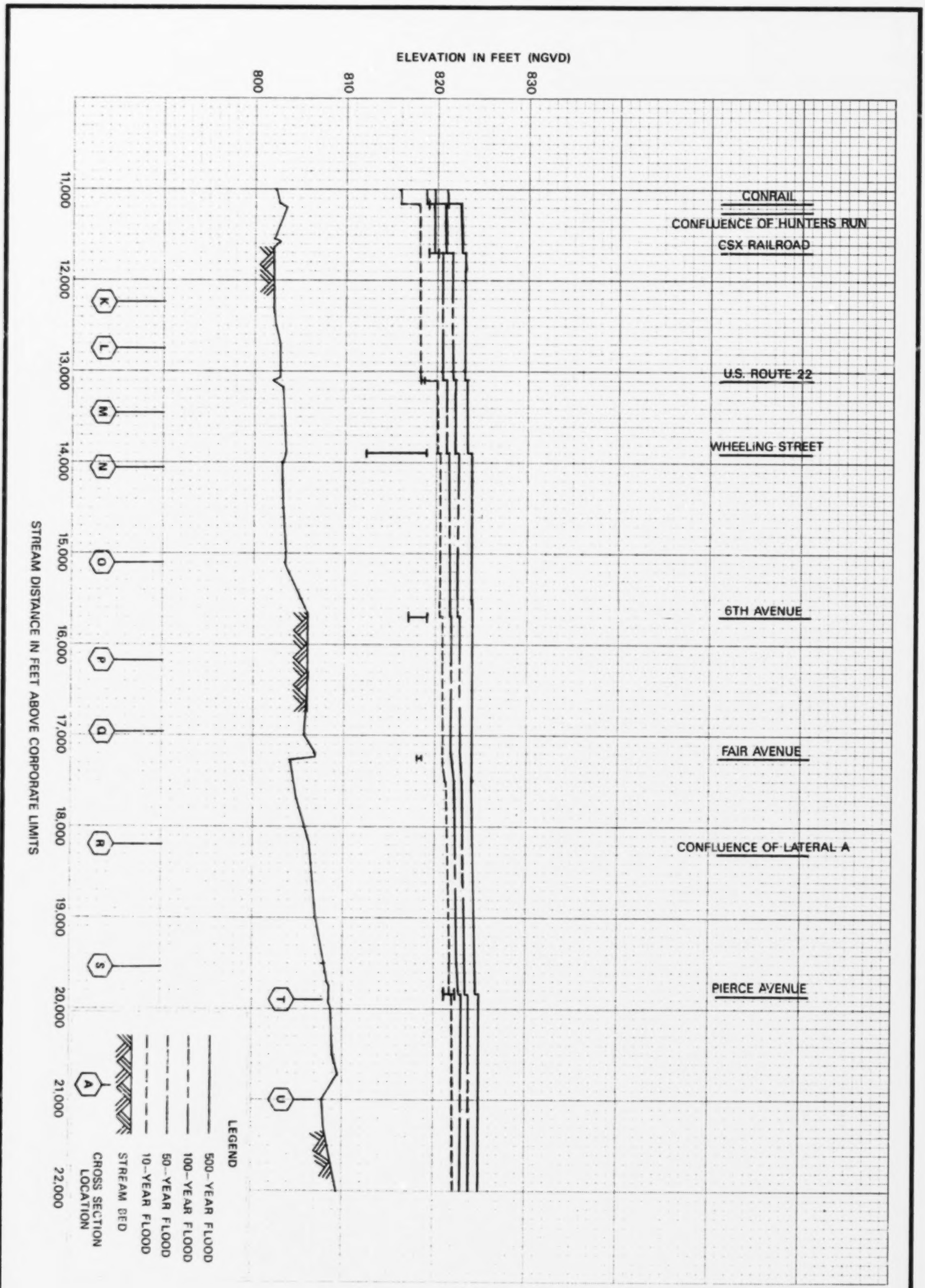


02P

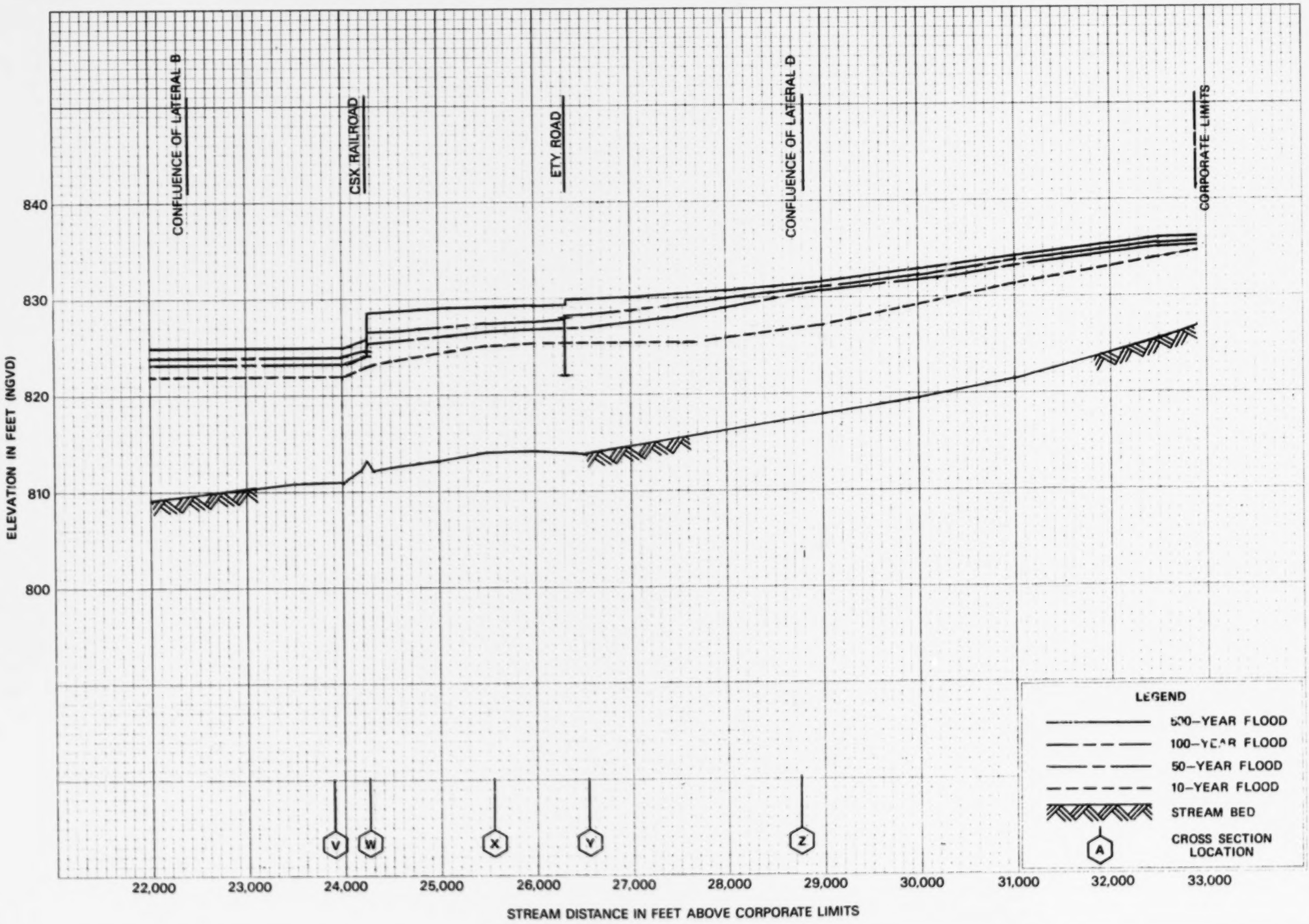
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH

(FAIRFIELD CO.)

FLOOD PROFILES

HOCKING RIVER



FLOOD PROFILES

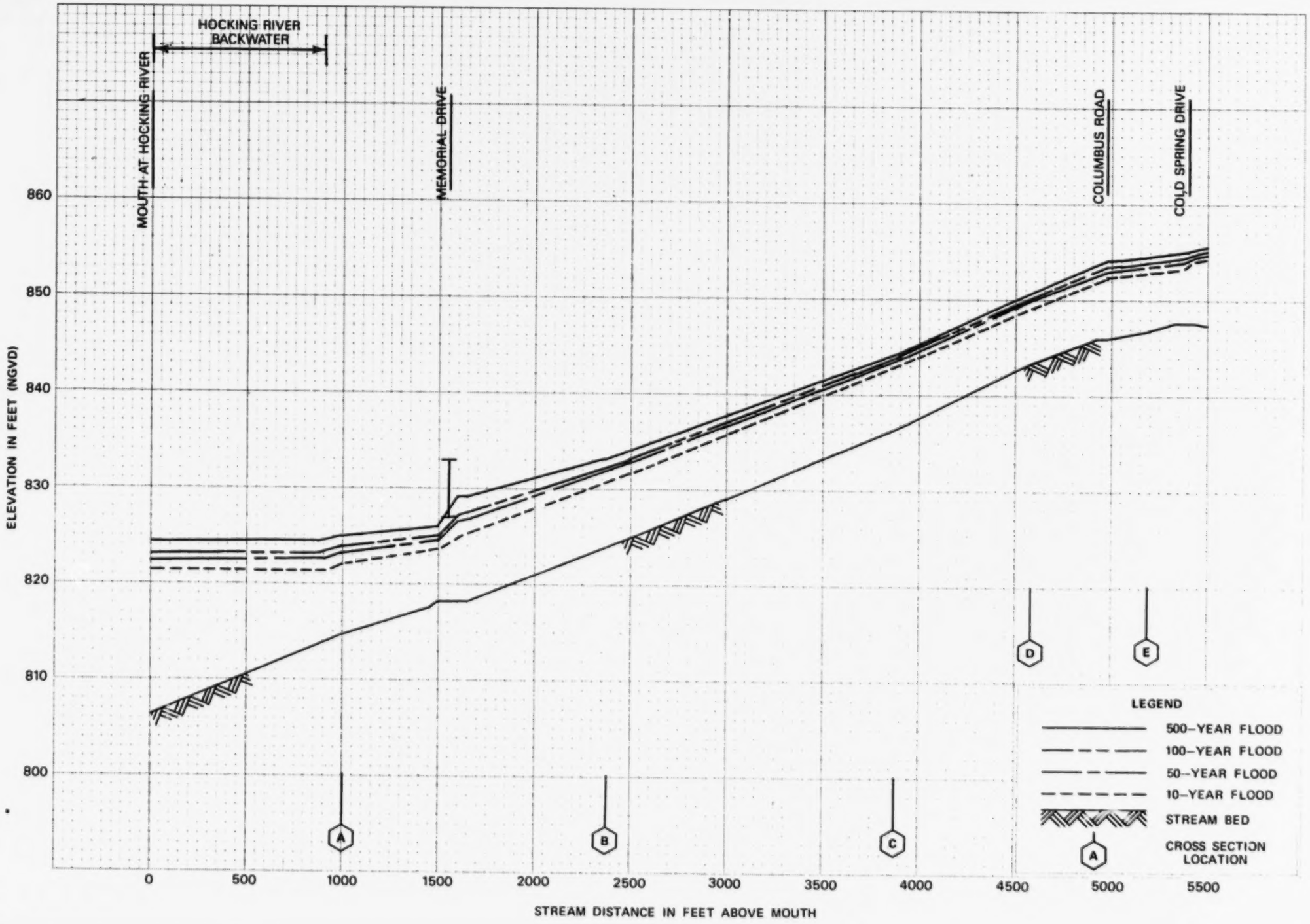
HOCKING RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH

(FAIRFIELD CO.)

03P



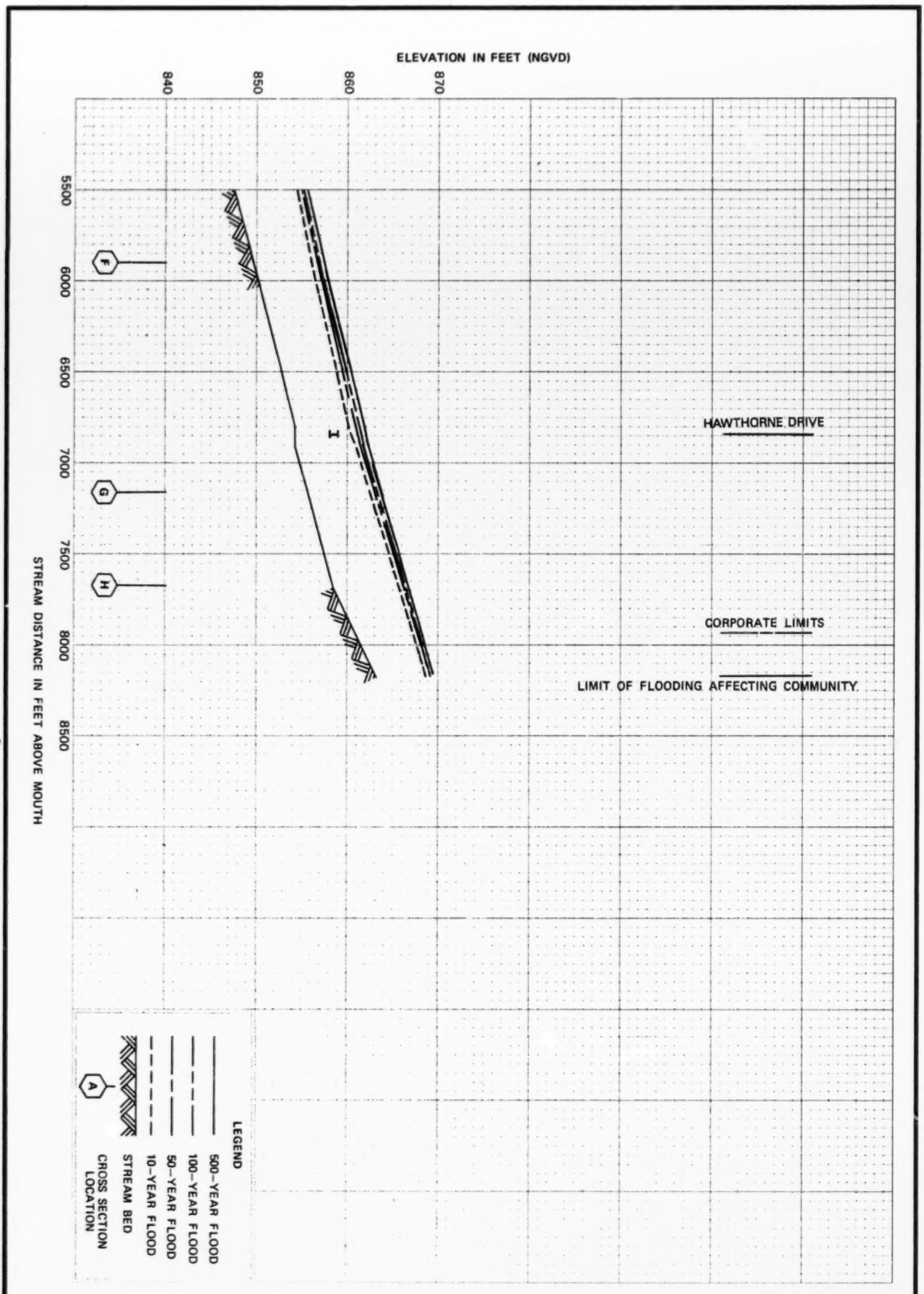
FLOOD PROFILES

LATERAL A

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

04P



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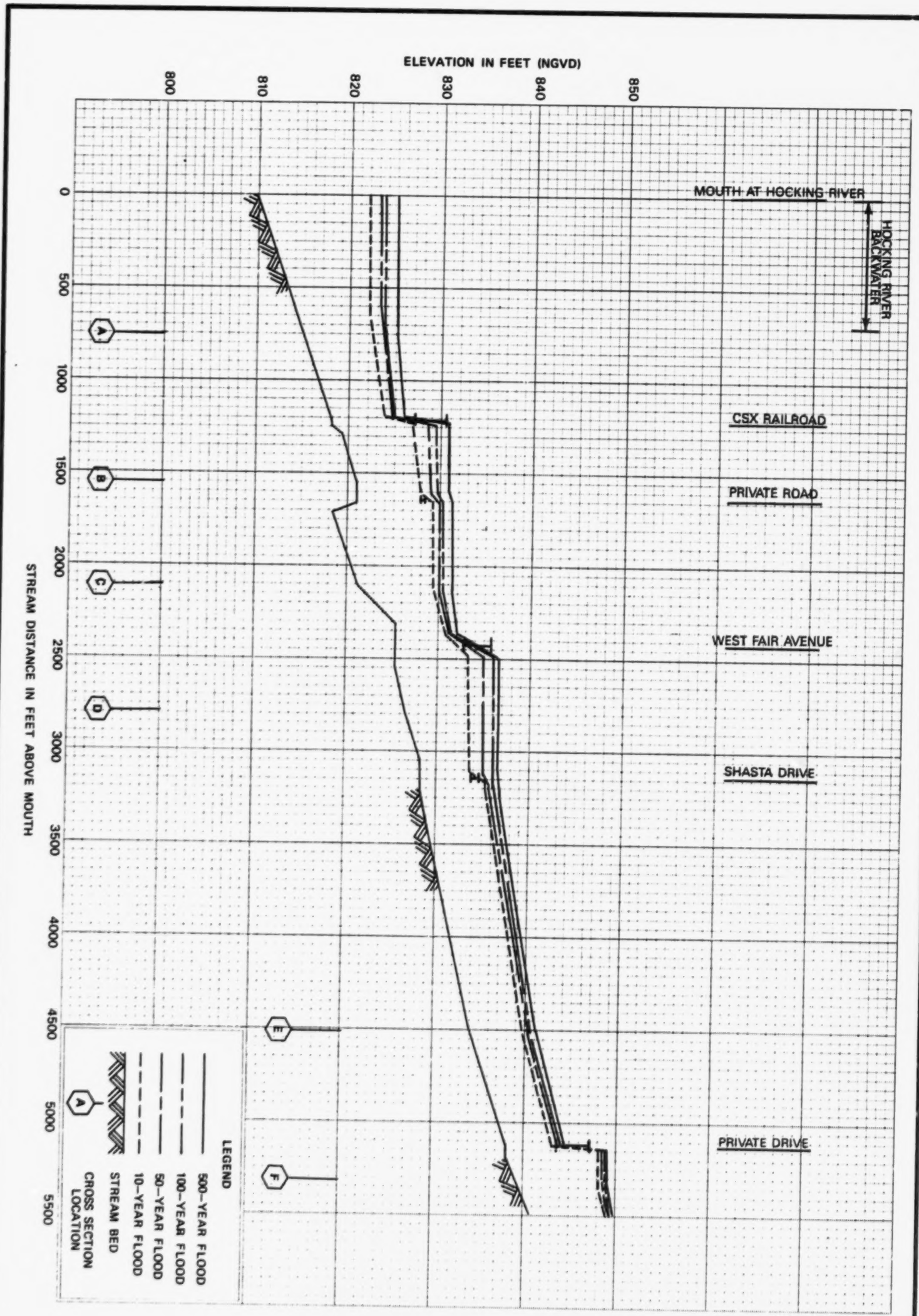
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH

(FAIRFIELD CO.)

FLOOD PROFILES

LATERAL A



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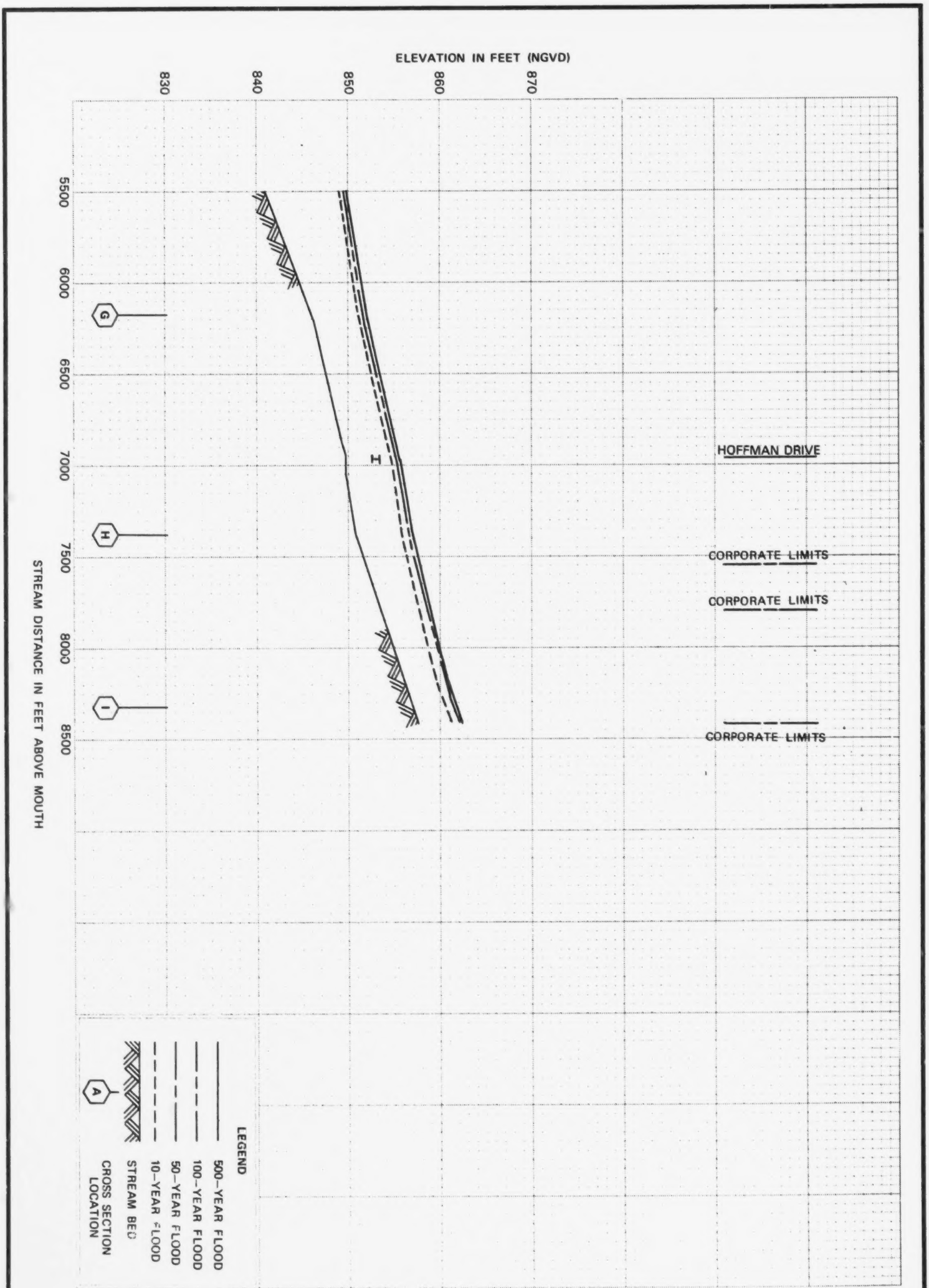

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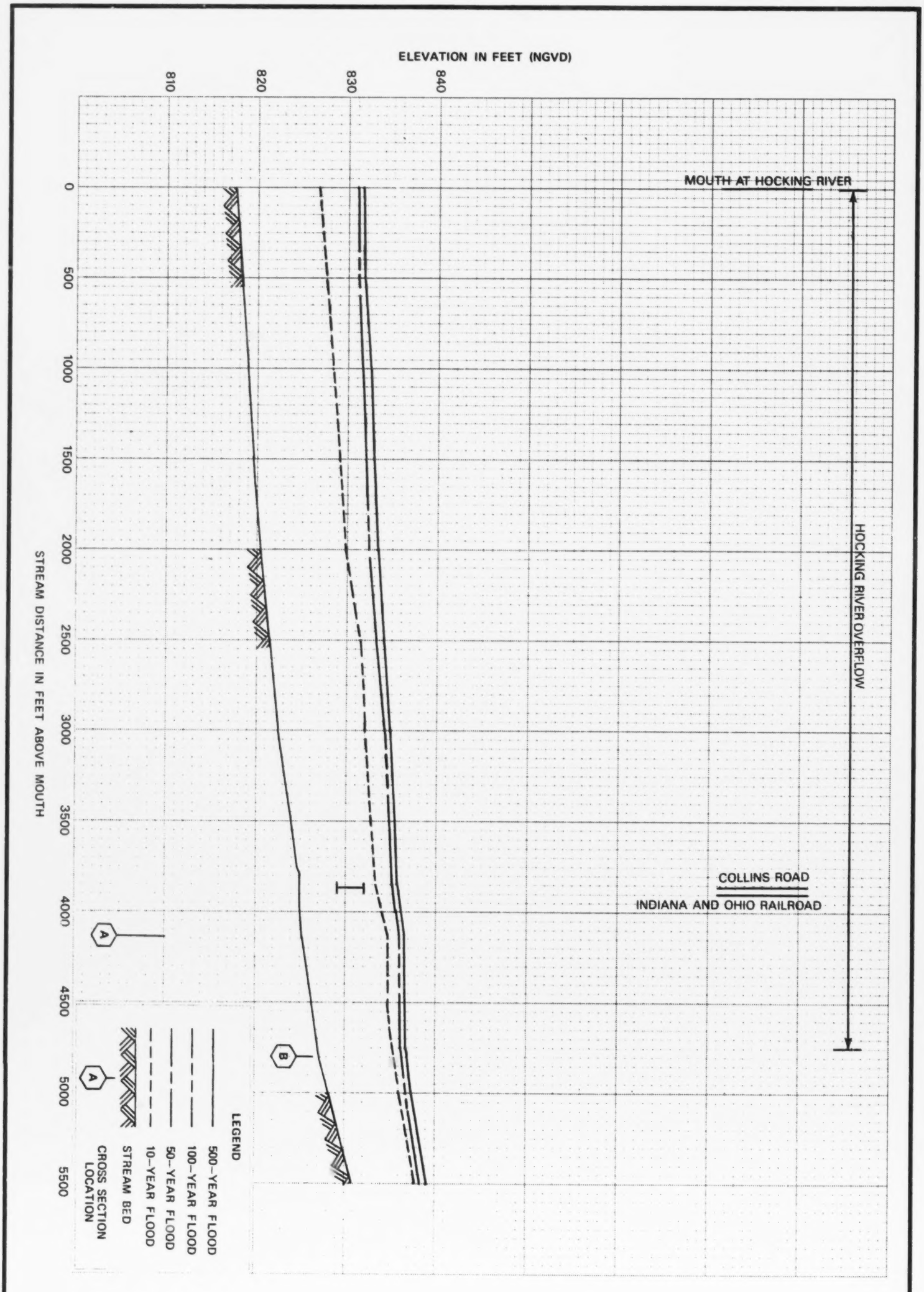
CITY OF LANCASTER, OH
(FAIRFIELD CO.)

FLOOD PROFILES

LATERAL B



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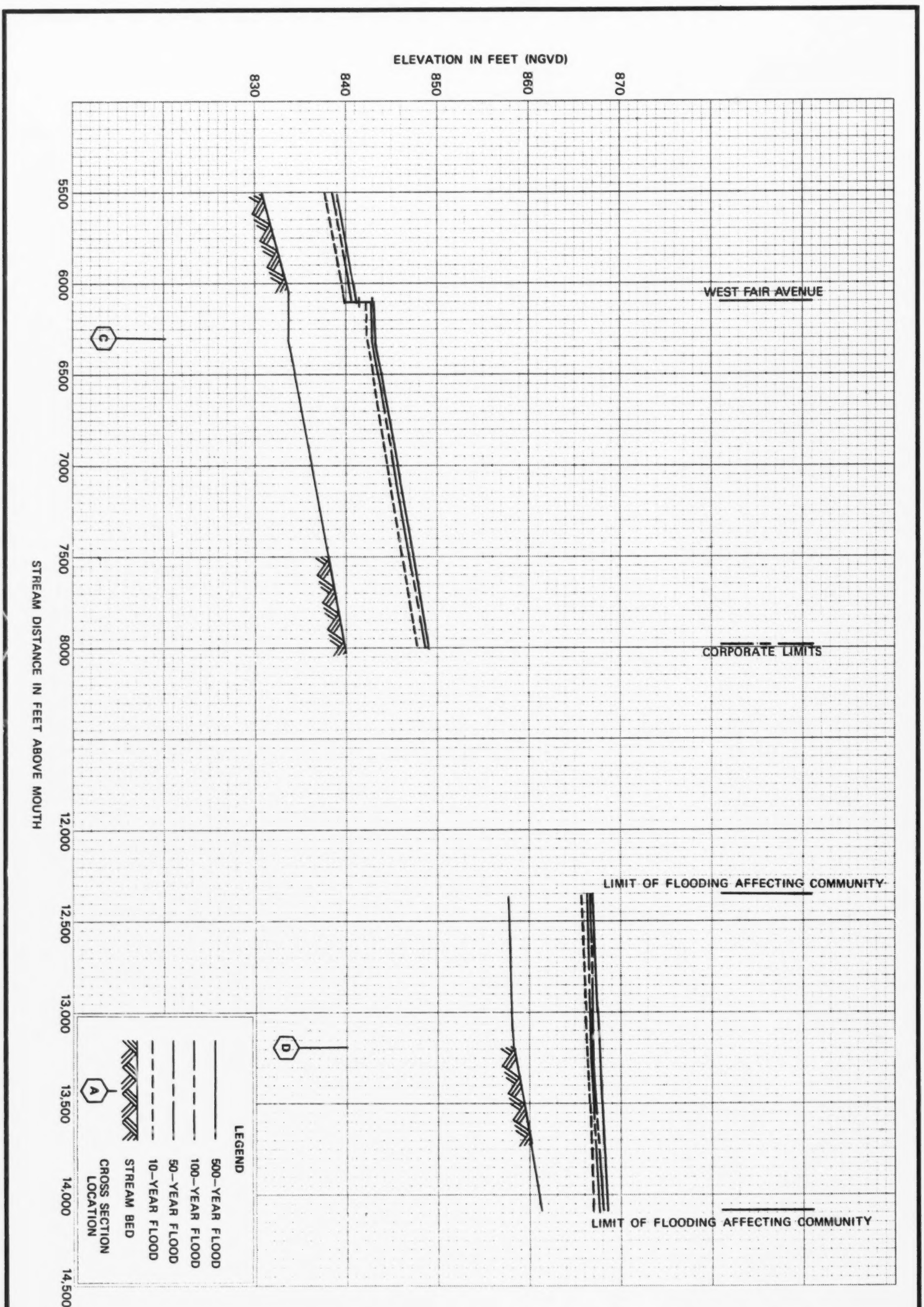
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH

(FAIRFIELD CO.)

FLOOD PROFILES

LATERAL D



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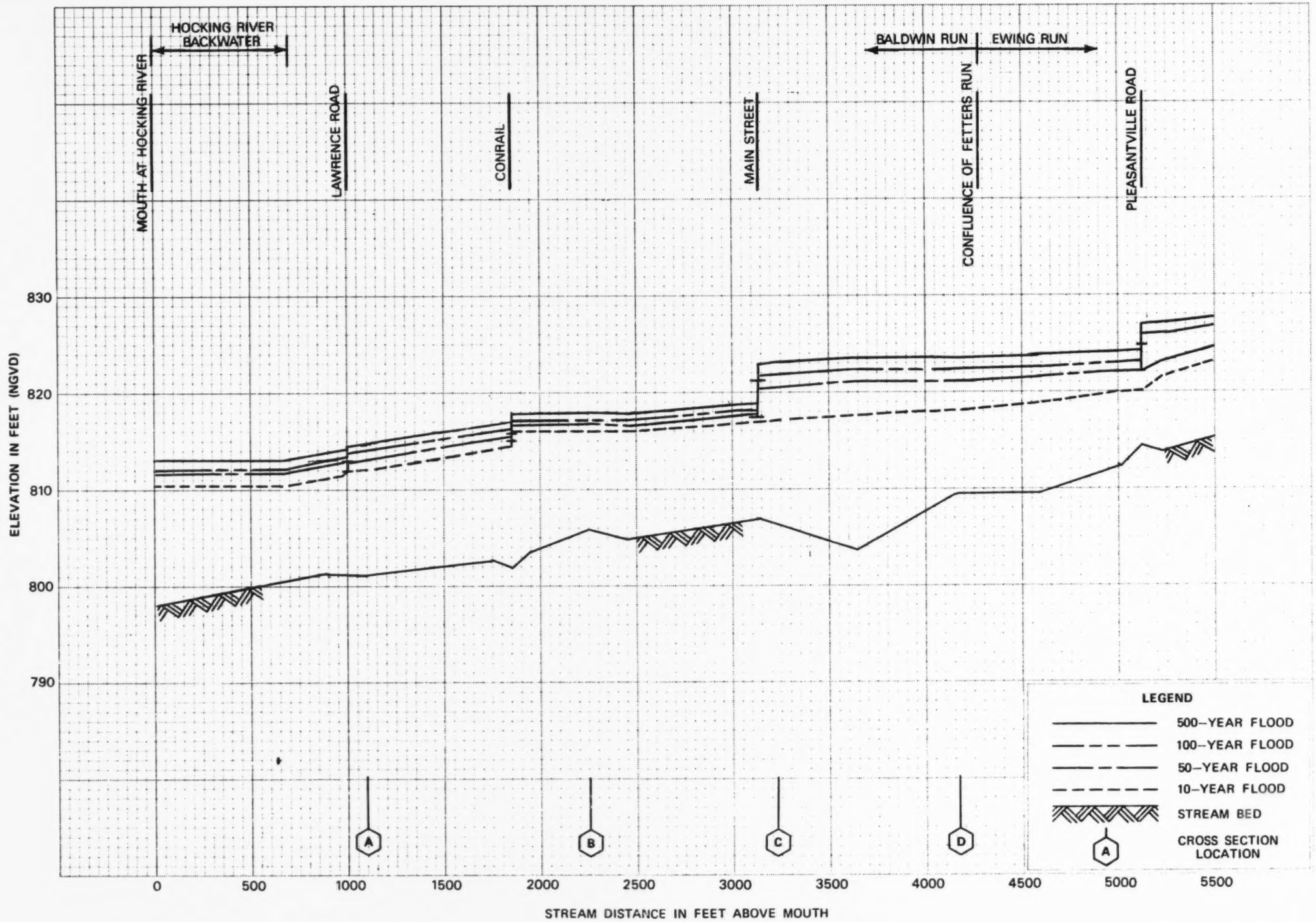
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH

(FAIRFIELD CO.)

FLOOD PROFILES

LATERAL D



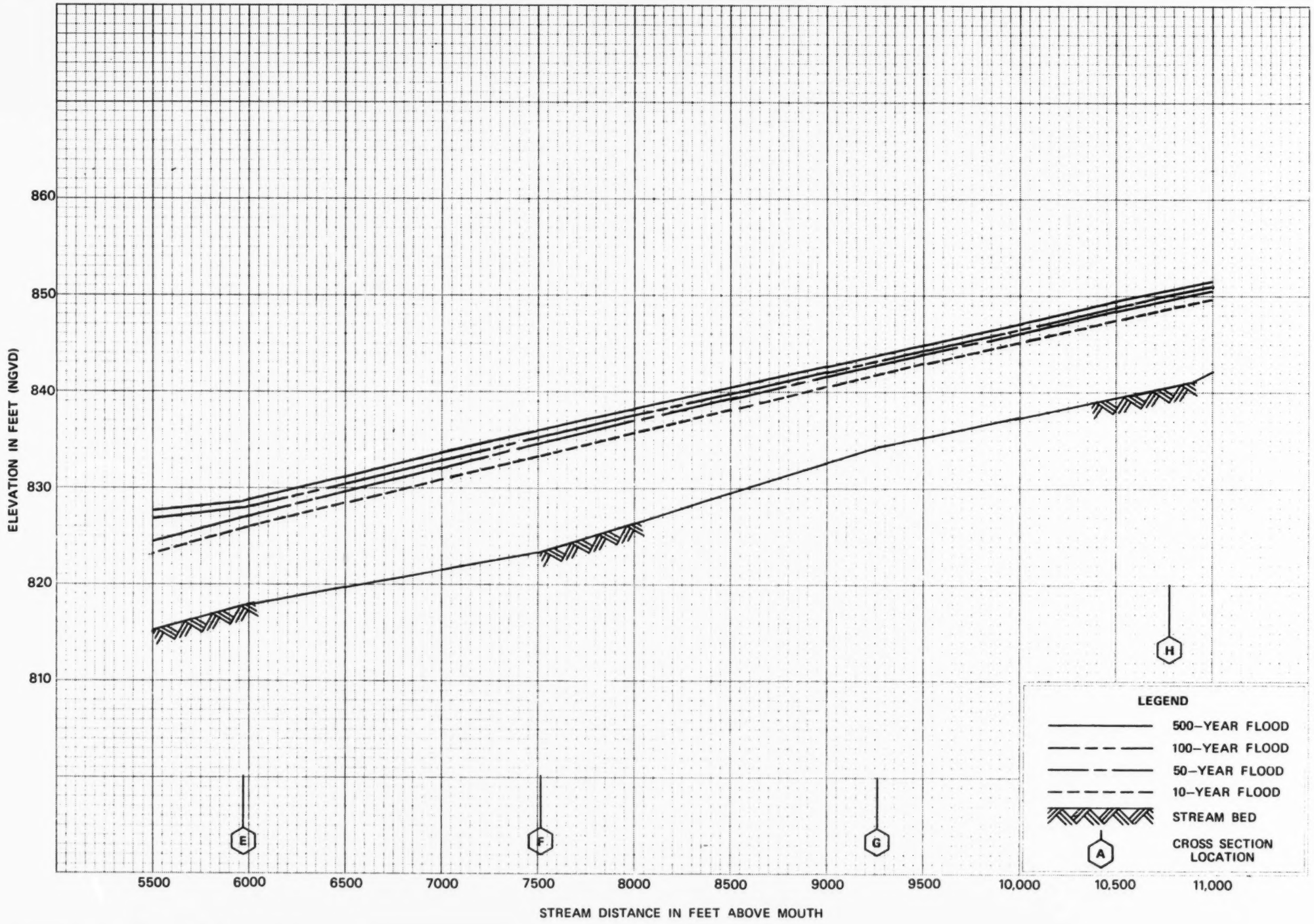
FLOOD PROFILES

BALDWIN RUN–EWING RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

10P



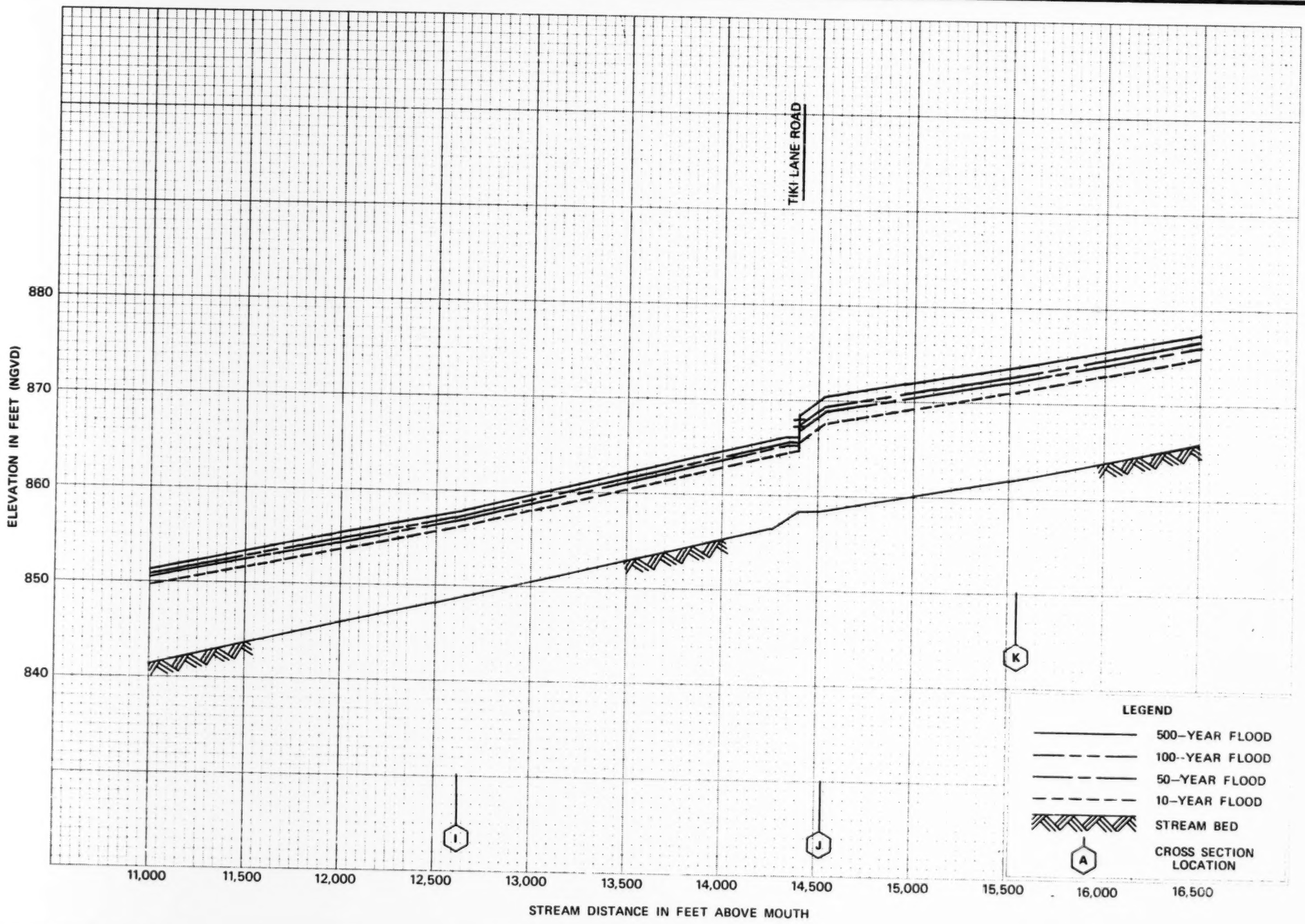
FLOOD PROFILES

EWING RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

11P



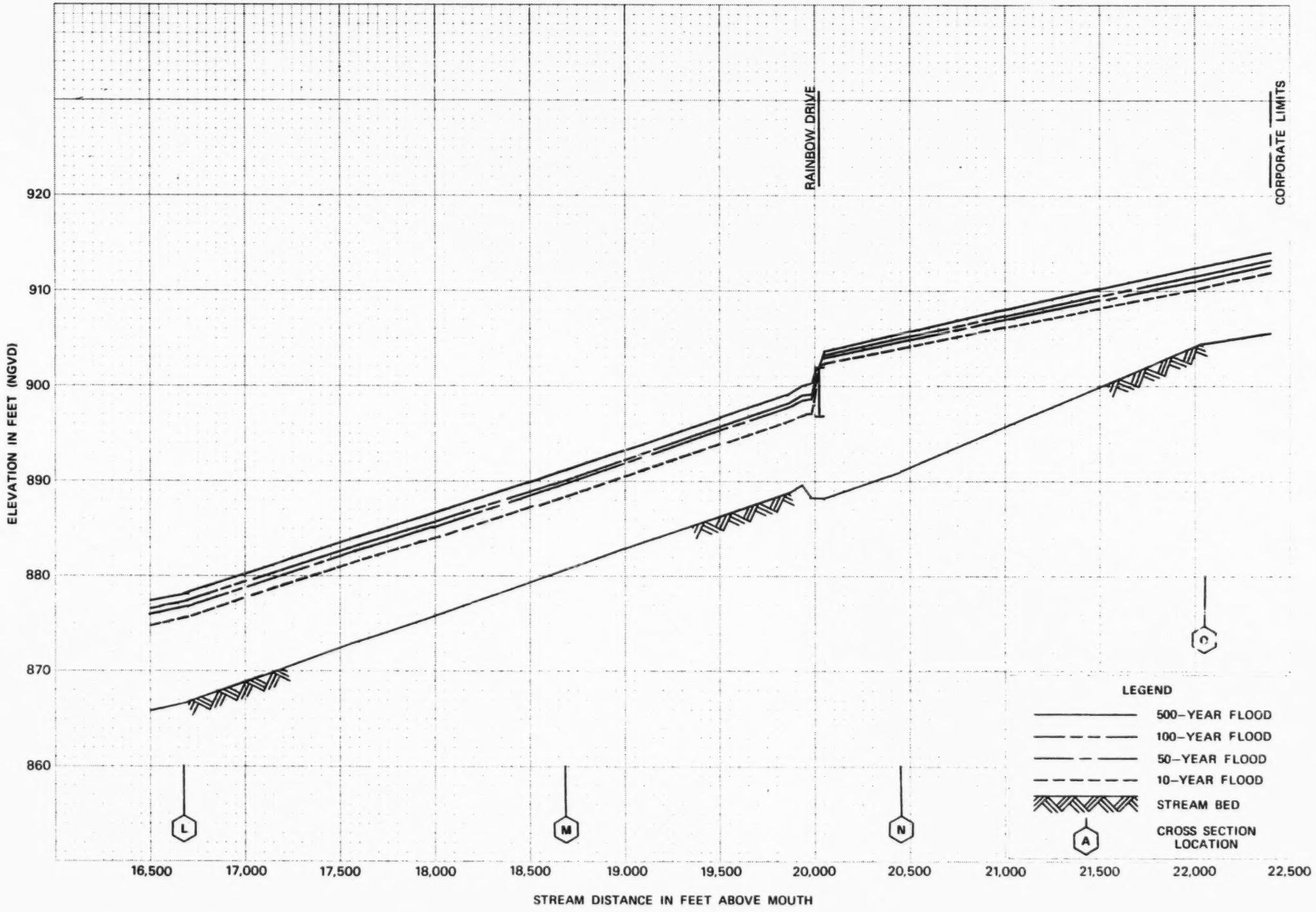
FLOOD PROFILES

EWING RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

12P



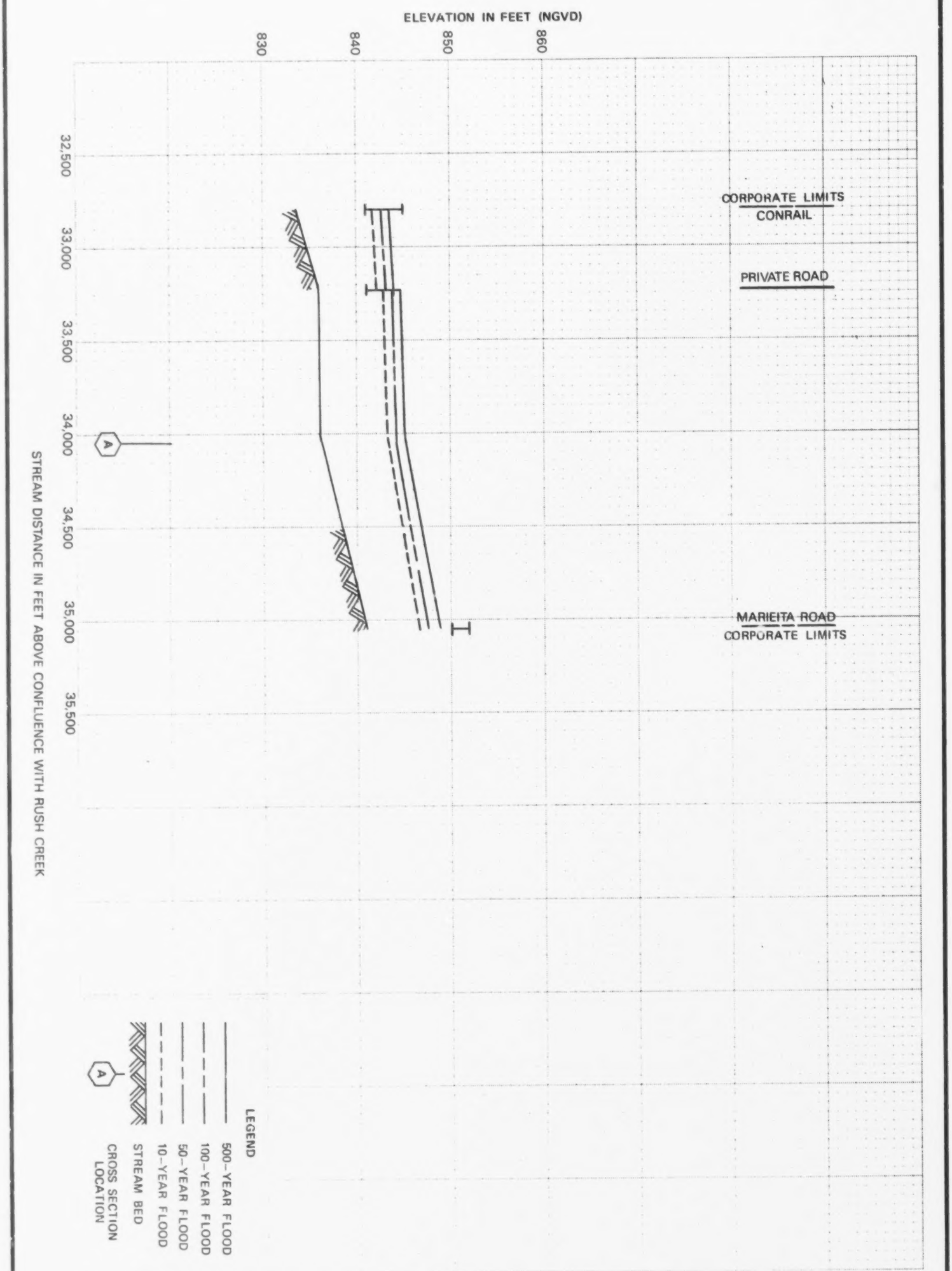
FLOOD PROFILES

EWING RUN

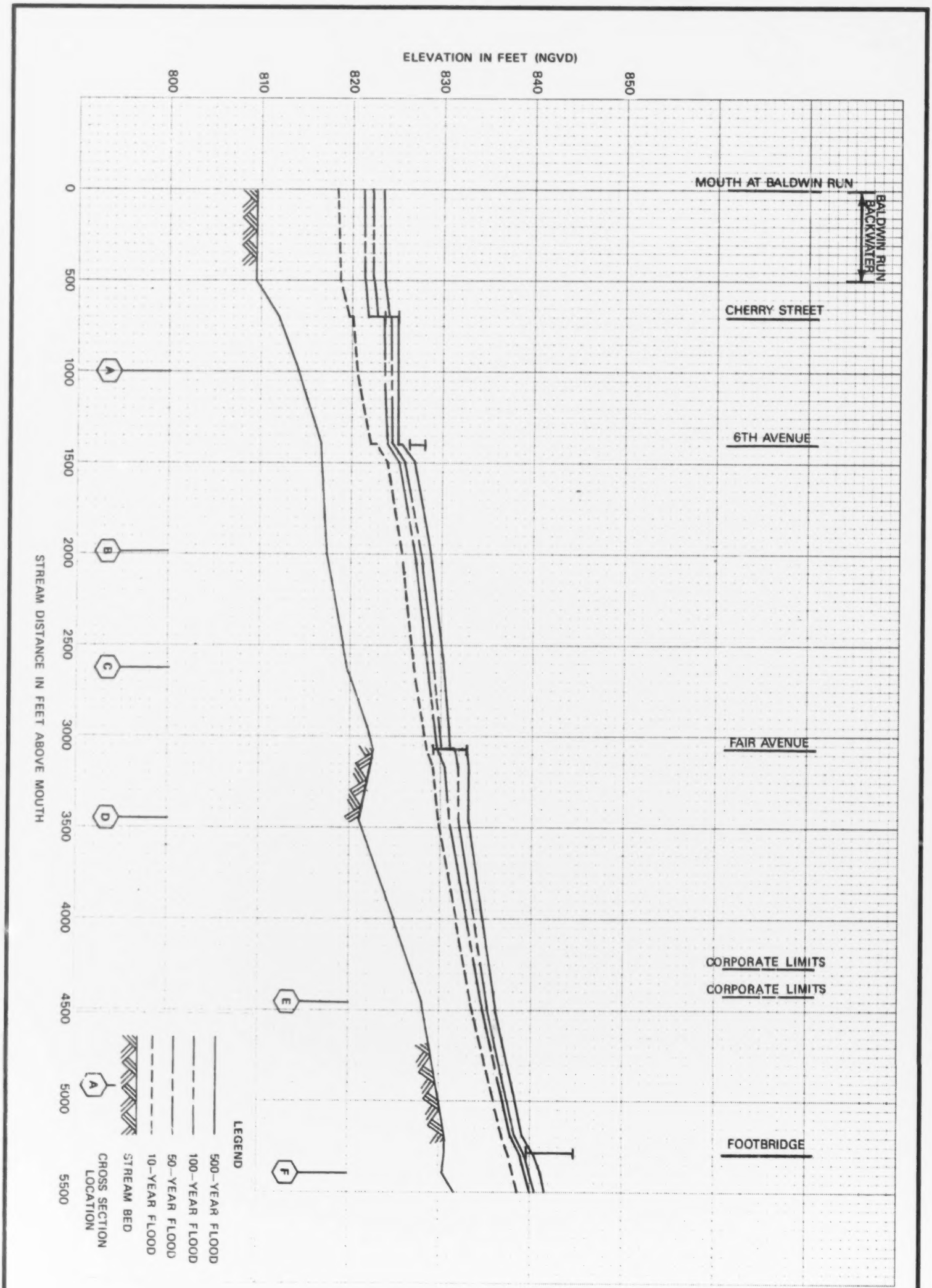
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

13P



14P	FEDERAL EMERGENCY MANAGEMENT AGENCY CITY OF LANCASTER, OH (FAIRFIELD CO.)	FLOOD PROFILES RACCOON RUN



15P

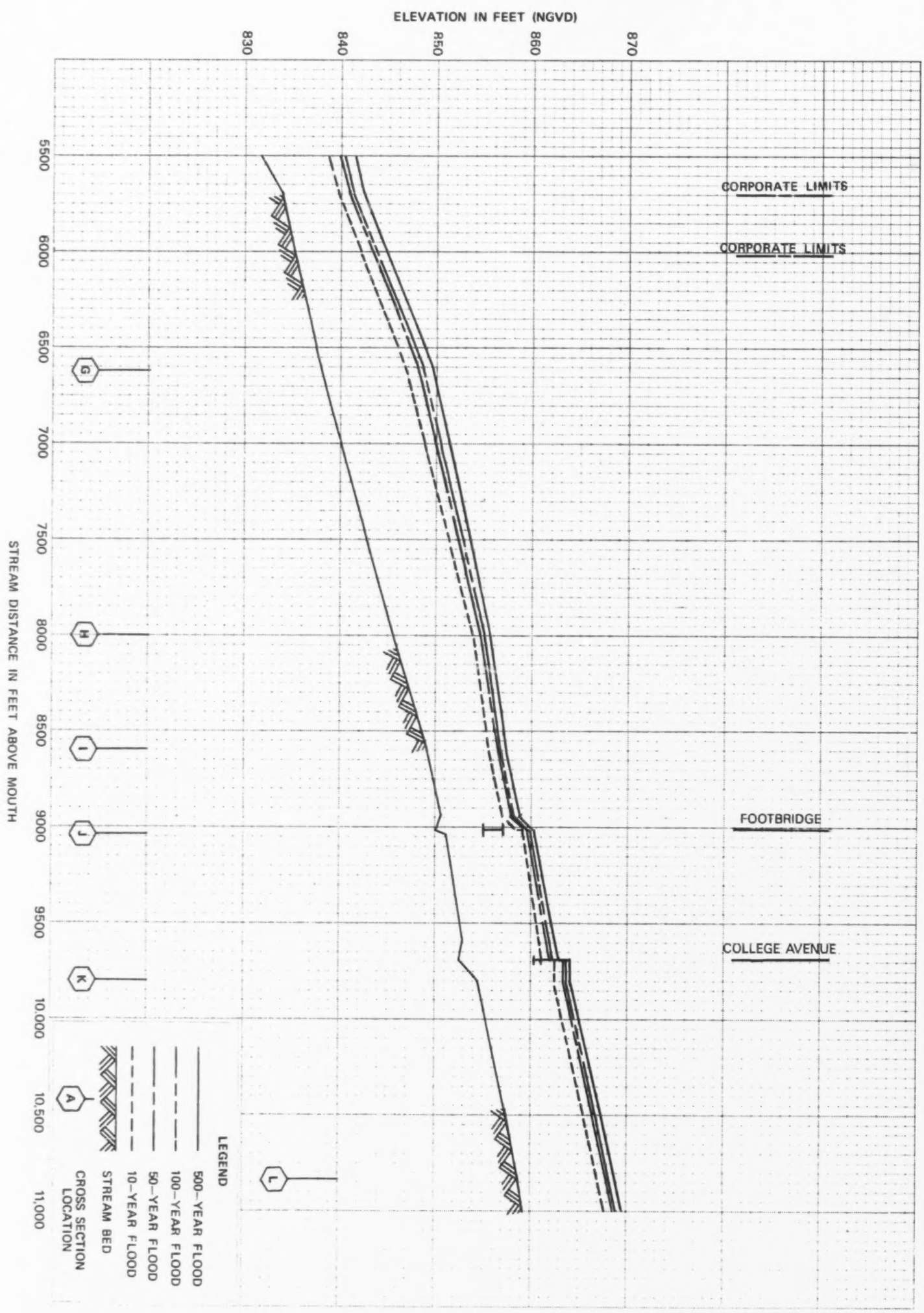
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH

(FAIRFIELD CO.)

FLOOD PROFILES

FETTERS RUN



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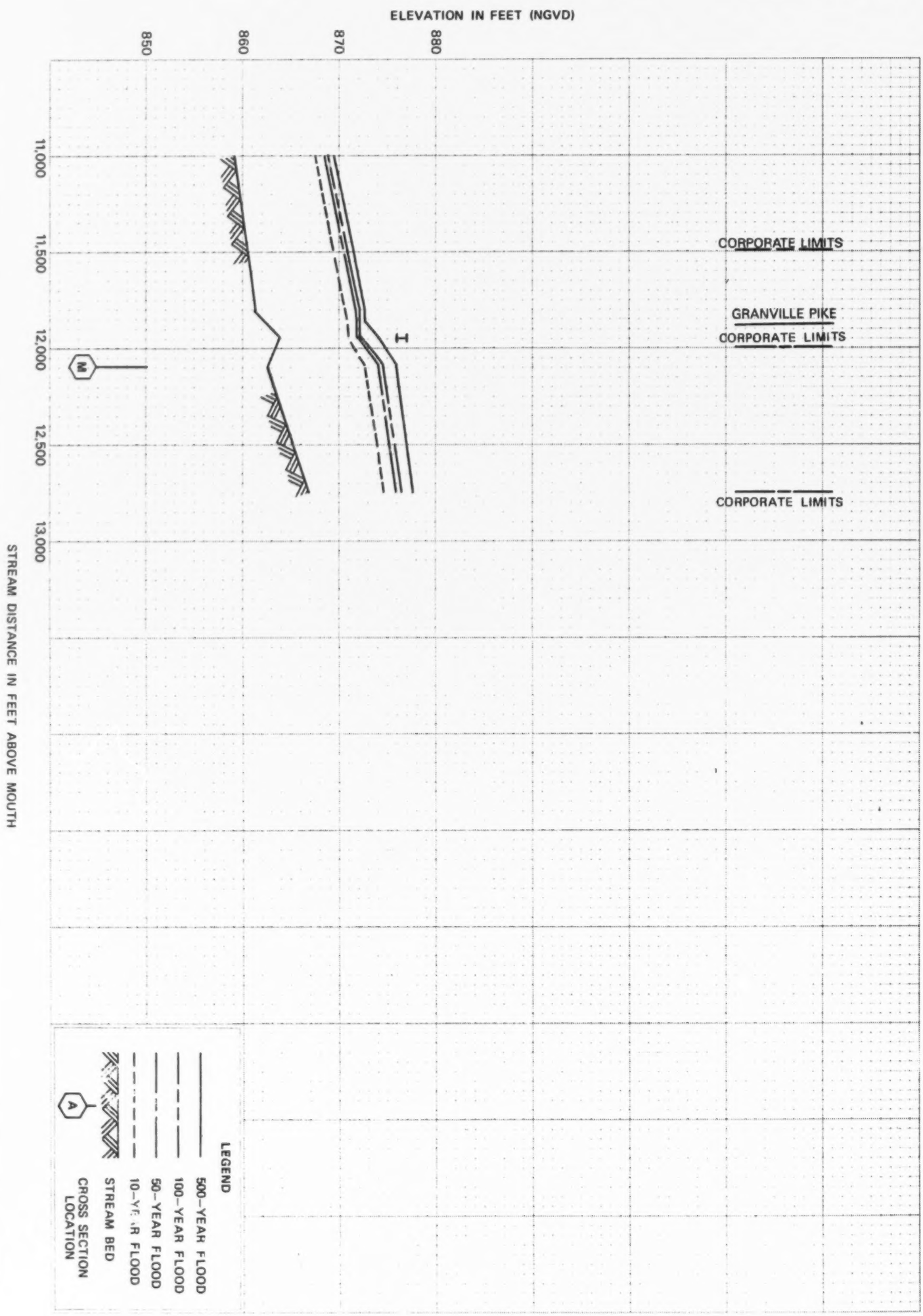

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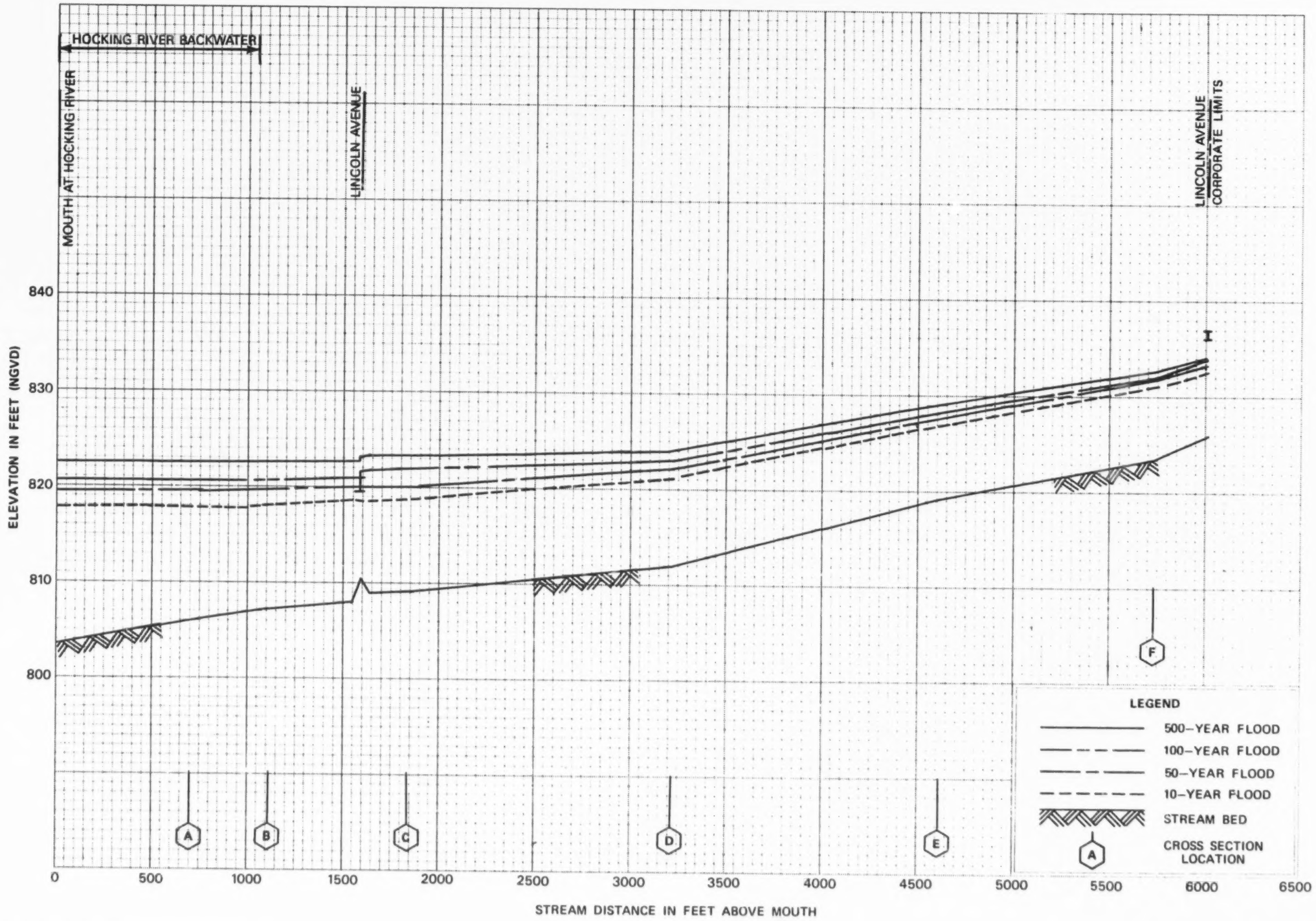


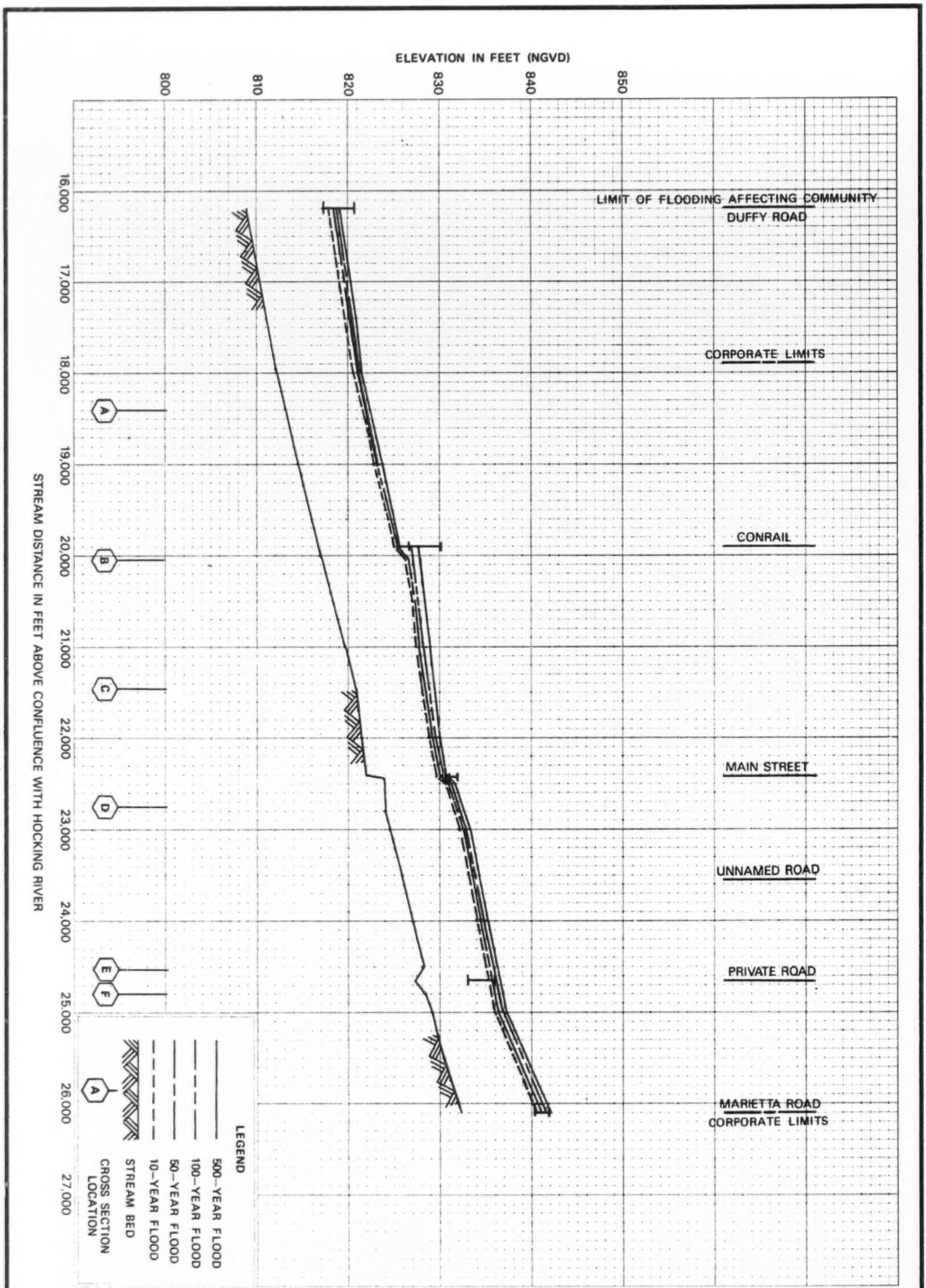
FLOOD PROFILES

HUNTERS RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

18P



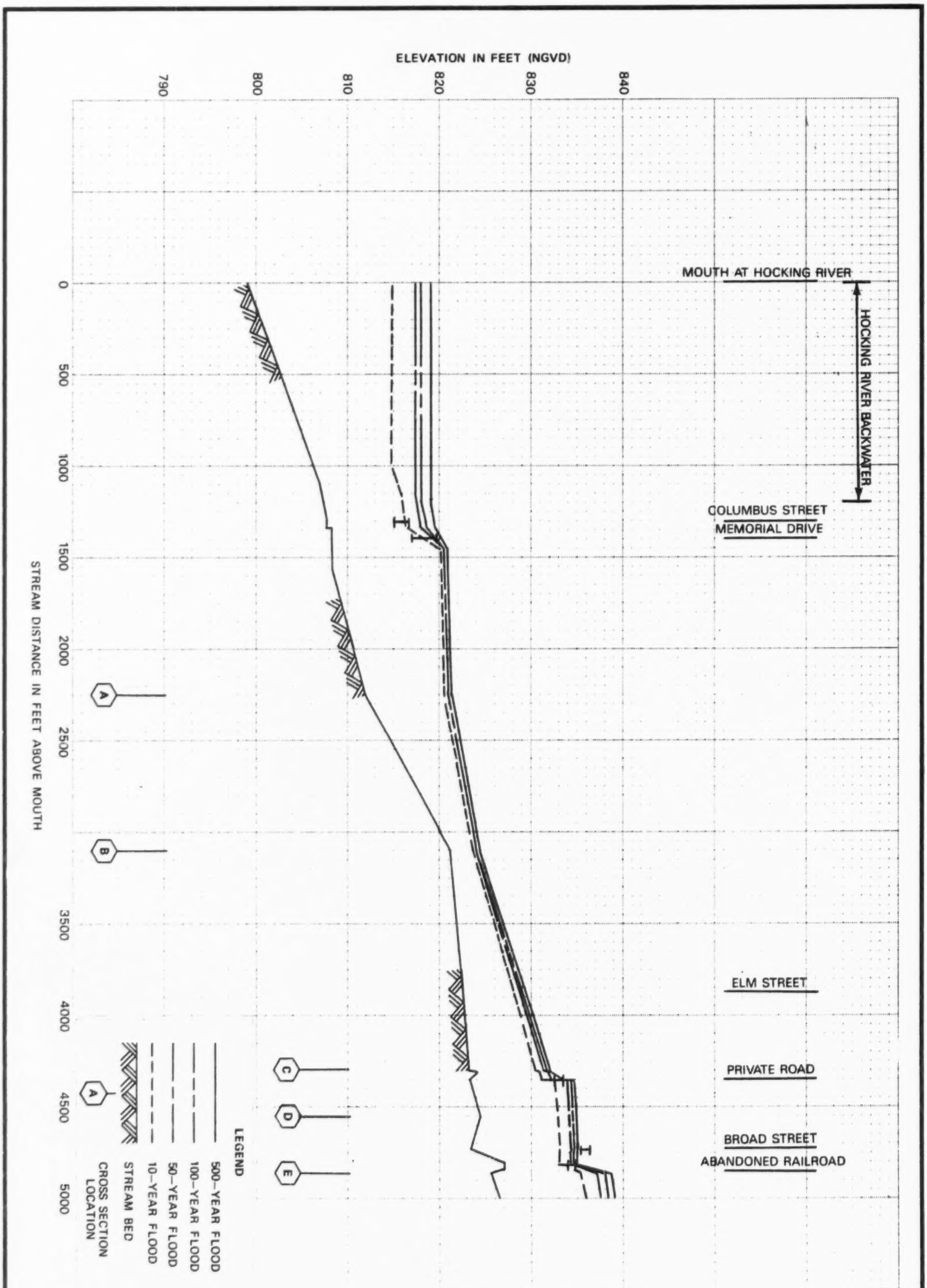
19P

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

FLOOD PROFILES

PLEASANT RUN



20P

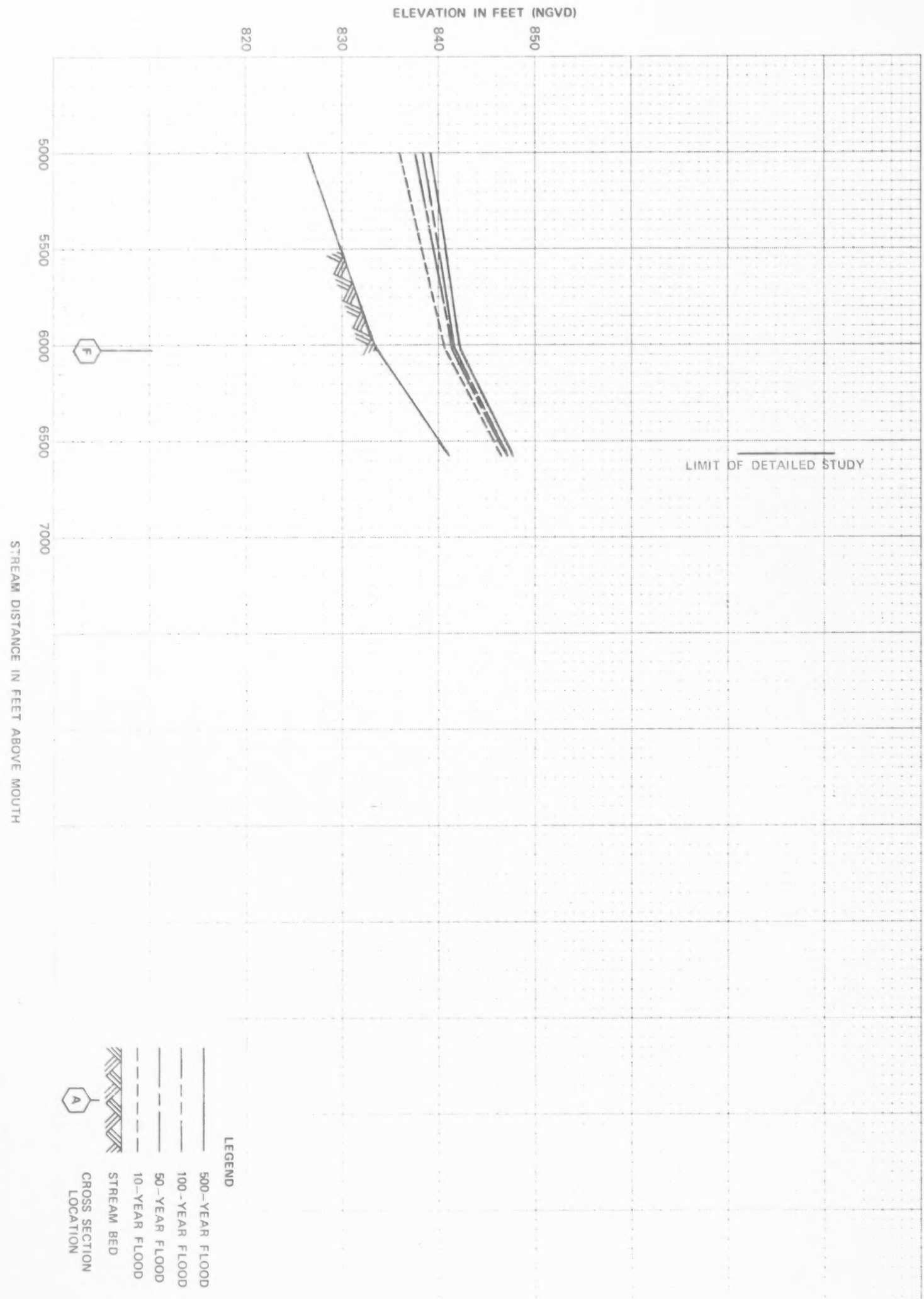
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OR

(FAIRFIELD CO.)

FLOOD PROFILES

TARHE RUN



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FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF LANCASTER, OH
(FAIRFIELD CO.)

FLOOD PROFILES

TARHE RUN